

A GLIMPSE INTO SATURN'S DEEPER CLOUDS: 5.2- μ m IMAGES OF THERMAL RADIANCE

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Images of Saturn made at 5.2 μ m with the NSFCAM facility camera at the Infrared Telescope Facility on Mauna Kea reveal a morphology clearly unlike that observed at any other wavelength. At this wavelength, most of Saturn's radiance is thermal emission rather than reflected sunlight. What is most remarkable is the presence of both an axisymmetric banded structure marked by colder brightness temperatures as well as large regions whose brightness temperature is some 8 - 10 K lower than that of most of the planet. These are "5- μ m cold spots", a negative counterpart to Jupiter's hot spots. Radiometric calibration of these images with respect to standard stars (ζ Cap and β Peg) shows that the thermal flux from most of the planet is characterized by brightness temperatures near 180 - 185 K, whereas the colder regions, both the bands and discrete, cold regions are closer to 172-175 K. The discrete cold features have no easily discernible counterpart in the visible or near-infrared that is dominated by reflected sunlight. The simplest explanation for this phenomenon is that the thermal radiation at 5.2 μ m is not as sensitive to the scattering or absorbing influence of small particles which reflect sunlight at shorter wavelengths and prevent seeing to the depths of these clouds. As a result, one can detect radiation emerging from a cloud system near 3 bars total pressure. We lack sufficient data at this time to determine whether the clouds are consistent with the zonal flow tracked from cloud features higher in the atmosphere, detected at shorter wavelengths in reflected sunlight. Exploration of these clouds would clearly benefit from examination by the Cassini VIMS experiment, with correlated studies by the ISS and CIRS experiments to search for correlation with subtle details evident in higher altitude clouds and the temperature and composition fields.